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INTERPRETATION OF WATER WORKS ACCOUNTS

By Mark Wolff

Certified Public Accountant

The author has met officially several members of this association, while examining the books and accounts of several water companies supplying certain districts of New York City, in connection with valuations for the readjustment of some of the rates and the establishment of an equitable basis for probable ultimate purchase of these plants by the city. During this work suggestions were asked for improving existing accounting systems of both office and field. During these inquiries attention was called to the pamphlet published by the Bureau of the Census, entitled "Uniform Accounts for Water Works," which, though considered a creditable work, has not proven successful from the standpoint of practicability. The difficulty seemed to be that it requires someone with extensive experience in water works accounts to devise and correctly install, with requisite forms, an appropriate system of accounts fitted to the individual requirements of a particular company. After a study of the census classification the author concluded that, while the accounts set forth are to all intents and purposes complete and scientific, they are by far too elaborate for a works of average size, and therefore not readily understood by the average superintendent of a water plant.

The introduction to the Census classification contains, among others, the following remarks:

> The annual revenues of different water works vary from less than $1000 to over $10,000,000 per annum, and their assets vary from less than $10,000 to over $150,000,000. The number of accounts that are required, or that can be used to advantage for administrative purposes by any enterprise, must vary with the volume of business and assets; and hence a uniform system of accounts must first of all be adjustable to the requirements of large and small enterprises. . . .

In the formulation of any standard system of accounts, provision must be made for the largest unit of the particular class of enterprise dealt with. For that reason, it was necessary to allow sufficient accounts for a system such as New York City's, with revenues of about $13,000,000 and assets of over $250,000,000. The same holds true of the cities of Chicago and Philadelphia. However, these three are the only cities which have a population of over a million, according to the 1910 census. This census lists the following number of cities with populations of 25,000 or over.

POPULATION	NO. OF CITIES	PER CENT
Over 1,000,000	3	1.4
From 200,000 to 999,999	25	10.9
From 100,000 to 199,999	22	9.6
From 25,000 to 99,999	179	78.1
	229	100.0

For the sake of comparison, it will be assumed, that there is but one water works system in a city. On this basis, allowing annual revenues of $2 per capita of population, there would be only twenty-eight systems in the United States earning over $400,000 total revenues per annum, or less than one-eighth of the largest cities in the country. The Census classification, being practically complete, is ideal for just such systems, with large revenues and extensive assets. Of course, no account is taken of the separate provision which would have to be made to meet the special budgetary and fund account requirements of practically all of the larger municipalities, of which nearly all of the twenty-eight shown above own and operate the water works systems.

A water plant capable of supplying 1,000,000 people would as an engineering proposition, of course, be considered too elaborate for a city of 100,000. The physical plants would be different in both cases. The same holds true of an accounting system arranged to record financially and statistically the operations and development of such an enterprise. Therefore, it will be necessary to plan a less elaborate set of accounts for the remaining 201 cities shown in the above table, as well as for the smaller cities not included above, which comprise the majority in the country.

As the engineering requirements of a water works will depend chiefly on the amount of population to be served and as the necessary accounting system will have to conform with the physical characteristics of the plant as laid out by the engineering department, the following classification based on population of cities and villages is made.

Class A	Population from 1,000 to 10,000
Class B	Population from 10,001 to 25,000
Class C	Population from 25,001 to 200,000
Class D	Population over 200,000

This paper will deal only with Class A and Class C. The accounting requirements of water works coming under Class B can readily be determined by modifying the accounts prescribed for Class C or augmenting those of Class A. No attempt will be made to set up accounts for the twenty-eight cities comprising Class D.

CLASS A

Plants supplying a territory with less than 10,000 population will, as a rule, require the most simple set of accounts. Such water works could well adopt simply the ten accounts of a single order mentioned by the Census Bureau. These accounts are as follows:

0. Water Service Revenues.
1. General Expenses.
2. Operating Expenses.
3. Maintenance Expenses.
4. Miscellaneous Revenues and Expenses.
5. Profit and Loss.
6. Fixed Assets and Funds.
7. Current and Nominal Assets.
8. Proprietary Interests.
9. Liabilities.

The contents of the above accounts may be described as follows:

0. Sale of water.
1. Overhead expenses.
2. Costs of labor, supplies and expenses used directly for operation of plant.
3. Costs of repairs and losses through depreciation.
4. All revenues and expenses not directly dependent upon service of water.
5. The summing up of preceding accounts, to determine net profit or loss of enterprise.
6. Actual cost of permanent property (fixed assets) and record of special funds.
7. Working capital of enterprise used for current operations.
8. Amount of proprietary interest in enterprise, which will agree with the sum of accounts 6 and 7 (assets) less account No. 9 (liabilities).
9. The recording of the obligations of the enterprise.

It will be seen from the above that these accounts have been arranged in the same order as they appear in the Census Classification, although it would be more logical to have assets and liabilities at the top of the list, as they relate chiefly to investment and construction which precede operation. The latter is represented by the remaining, or revenue and expense, accounts. In most instances, there would be little, if any, occasion to use the revenues and expense accounts until the original construction were well under way or completed, and operation of the plant commenced. Accordingly, the discussion will be commenced by referring first to the asset and liability, or indicant, accounts. To this end, these accounts are assembled into a Balance Sheet. The figures used here, as well as in all other parts of this article, are, of course, not taken from the books of any particular works. They are, further, mere approximations and are not guaranteed as to being always representative in amount. Such theoretical figures are used merely for the purpose of illustration.

Balance Sheet

Assets		
Fixed	$40,000	
Current	10,000	
Total		$50,000
Liabilities		15,000
Proprietary Interests		$35,000

The interrelationship of these accounts can be determined from the Balance Sheet shown above. But, simple as that may be to an accountant, it will not afford the same perspective to the eye of the engineer as a graphic chart. Accordingly, this Balance Sheet is expressed in the form of a diagram, as shown in Diagram No. I.

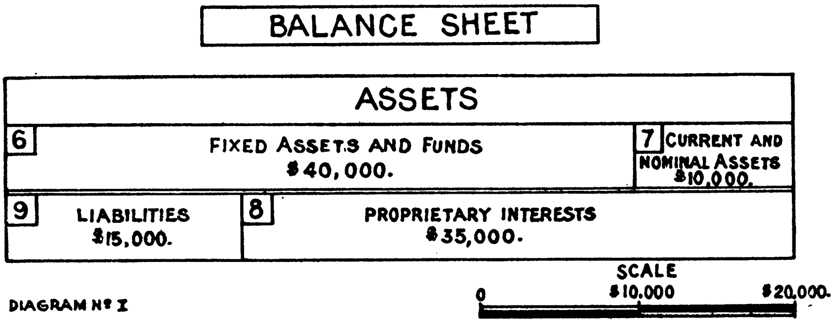

BALANCE SHEET
ASSETS
6 FIXED ASSETS AND FUNDS $40,000.
7 CURRENT AND NOMINAL ASSETS $10,000.
9 LIABILITIES $15,000.
8 PROPRIETARY INTERESTS $35,000.
SCALE
0
$10,000
$20,000.

DIAGRAM Nº I

It is seen from the diagram that the Balance Sheet is a statement of financial condition, showing in this case two classes of assets, provided for by accounts 6 and 7, against which are measured the liabilities and proprietorship contained in accounts 8 and 9. This diagram indicates that the total of assets is equal to the liabilities plus proprietorship, as expressed by the following equation:

Assets = Liabilities + Proprietary Interests.

This equation is constantly present in double entry bookkeeping, which is the basis of all modern accounting. It may also be expressed in another way, to wit:

Assets − Liabilities = Proprietary Interests.

The diagram shows not only the relationship of the accounts, but also purports to show with approximate accuracy the relative financial value of each of its components, as expressed by the space allotted to the individual accounts.

Let us for a moment speculate as to what details support the accounts shown by the Balance Sheet. Fixed assets might consist of landed or nonlanded, tangible or intangible property; current assets might consist of cash, accounts receivable, notes receivable, investments, etc. The liabilities might be long term, or fixed, or short term, floating. A Balance Sheet in the form of the one under discussion opens up quite a wide field of speculation, a rather dangerous experiment from the standpoint of the several parties at interest in a larger enterprise. In such an enterprise, it is therefore necessary to have the accounts in more detail, so that as little as possible is left to the imagination. A statement of financial condition showing this necessary detail is shown in diagram No. III representing a Balance Sheet for water works in Class C, to be more particularly referred to later in this paper.

The purpose of accounting is to show:

(1) The condition of the business. (2) The progress of the business.

The first purpose, that of condition, has already been fulfilled in the Balance Sheet described hereinbefore. The second purpose, that of progress, is indicated by the Income Account. The accounts comprising it are in accordance with the Census Classification for small companies, classed as A.

INCOME ACCOUNT

REVENUES		
Water service	$8,000	
Miscellaneous	2,000	
Total revenues		$10,000
EXPENSES		
General	$1,500	
Operation	3,000	
Maintenance	2,000	
Miscellaneous	500	
Total expenses		7,000
Profit to proprietary interests		$3,000

This arranged in diagram form is as follows:

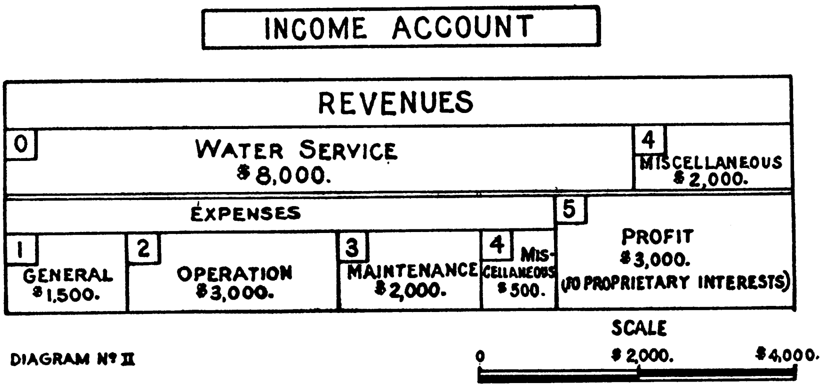


DIAGRAM N° II

The diagram consists of two parts, one revenues, against which is applied the second part, expenses, the difference being the profit for the period.

Expressed algebraically, this diagram would make this equation:

$$\text{Revenues} = \text{Expenses} + \text{Profit}$$

or

$$\text{Revenues} - \text{Expenses} = \text{Profit}$$

The revenues are divided into two parts, water service and miscellaneous; the expenses into four, general, operation, maintenance and miscellaneous. Space is allotted to the various accounts practically according to scale. As the Income Account shows the progress of the business, its components are a temporary set of accounts, sometimes called economic, which collectively record the changes in the net wealth due to the business operations of a stated period, usually the fiscal year. The result shown by this account is necessarily transferred to the proprietary interests; if a profit, it is added thereto; if a loss, it is subtracted therefrom. Therefore, since the proprietary interests absorb the results of the income account, it has two components, as follows:

Proprietorship = Capital at beginning of period + Profit during period

or

Proprietorship = Capital at beginning of period − Loss during period.

The result of the Income Account, transferred to the proprietary interests at the end of the fiscal year, will change the Balance Sheet, or, in other words, show a condition different from that at the beginning of the fiscal year. Therefore a complete equation of the Balance Sheet will be:

Assets = Liabilities + Proprietorship (at beginning) + Gain (or − Loss).

Since the Income Account shows progress or recession of the past, the administrator should be able to obtain valuable information from it, for his future guidance. The work of profiting from past experience in a water works belongs almost exclusively to the operating engineer, but accountancy will go a long way towards helping the engineer. The latter, already having the characteristics of the physical plant at his fingers' tips, so to speak, will be able to estimate what the approximate cost of operation should be. An adequate classification of accounts, supported by a properly installed and efficiently administered system of office and field records will enable him to check up his estimates in sufficient detail, so that he may quickly locate points at which economies can be effected, etc.

The Income Account shown in diagram No. 1 does not provide the detail necessary to enable the engineer to properly administer and operate a plant of any magnitude. It is not sufficient for him to know in a lump sum, using the figures in the chart, that the general expenses were $1500, cost of operation $3000, maintenance $2000 and miscellaneous $500. These figures would of course be useful to some extent, but he would also want to know the details of which they are comprised. For example, under operation, he would, for a water system of any size, want to know the total cost of pumping; how much of this cost was expended for labor, how much for fuel, how much for oil, packing, waste, etc., so that he may be able to complete his pumping efficiency records and determine the total consumption of coal, the average cost per ton, the average million foot pounds per 100 pounds of coal and also the total cost per million gallons raised one foot. Under maintenance, it would be desirable to know what was the total cost of repairs to the distribution system, how much for mains, hydrants, meters, standpipe, etc. All these, and more, facts would not only aid materially in locating waste and effecting economies, but would be essential to the establishment of a proper charge for domestic service and fire protection. This thought could be pursued further, but will assume that at least sufficient reasons have been given why the Income Account should be augmented in a larger organization, just as it has been shown why the Balance Sheet for the smallest water works would not do for larger enterprises.

This leads us up to the point where the accounting requirements of the next class (C) are to be considered. It will be remembered that accounts are not to be prescribed for Class B, as that can readily be done by the reader, with the aid of Classes A and C. That portion of the foregoing remarks which relates to general accounting principles, of course, applies also to what follows. It is therefore unnecessary to repeat the theory of the Balance Sheet and Income Account; in fact, the mention of it in the first place was made with hesitation, but, on second consideration, it was decided to incorporate it, since it may help some to a better understanding of the subject.

CLASS C

Water works serving a population of from 25,000 up will naturally require a more extended classification than is provided by the ten accounts of a single order prescribed by the Census Bureau for small companies; in fact, as hereinbefore stated, such a small number of accounts will undoubtedly be found inadequate for water works in Class B, serving a population from 10,000 to 25,000.

The following Condensed Balance Sheet is intended for companies in Class C. It is arranged to some extent in compliance with the general classification prescribed by public utility commissions.

Balance Sheet

Assets

Fixed Capital				
Landed		$75,000		
Non Landed				
Tangible	$2,125,000			
Intangible	150,000	2,275,000	$2,350,000	
Floating Capital			140,000	
Miscellaneous			10,000	
Total Assets				$2,500,000

Liabilities

Funded Debt	$1,000,000	
Deposits	75,000	
Prepayments	30,000	
Floating Debt	120,000	
Total Liabilities		1,225,000
Proprietorship		$1,275,000

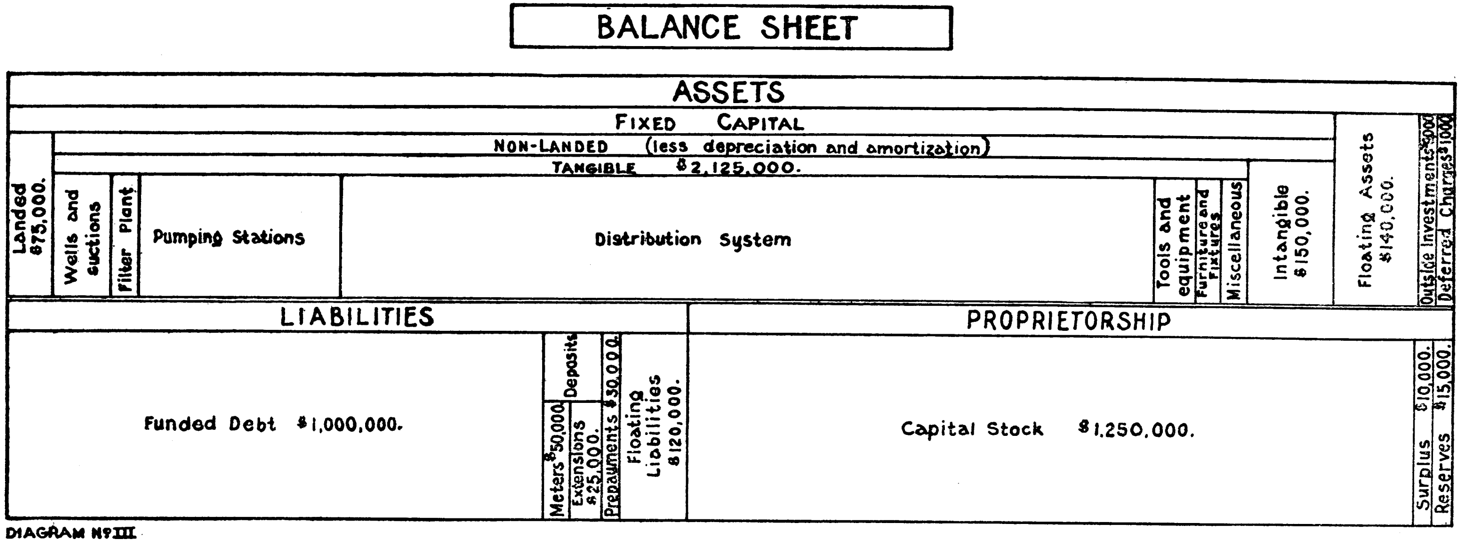
Proprietorship

Capital Stock	$1,200,000
Reserves for Extensions and Betterments	15,000
Surplus and Undivided Profits	10,000

This is shown in diagram form on the following page.

It will be seen that the above Balance Sheet in both ordinary and diagram form consists of general accounts representing summaries of specific assets, liabilities, etc. The necessary detailed accounts will be found on pages 539–41 in ordinary form and opposite page 540 in diagram form. While the diagram shows a scale, not all parts of it are strictly in accordance with that scale. But with a little study the eye of an engineer will see more in diagram IV than in the ordinary form of Balance Sheet.

The preceding accounts are representative of what one might expect to find in a water works of this class. By that it is not meant that all such plants will have these exact accounts. Some may have more: others less. This form is intended as a suggestion. With it as a working basis and with a particular local situation in mind, what little excess there may be for a particular company can easily be eliminated and any deficiency can readily be supplied. The accounts here shown are based partly on the requirements of


BALANCE SHEET
ASSETS
FIXED CAPITAL
Landed $75,000.
NON-LANDED (less depreciation and amortization)
TANGIBLE $2,125,000.
Wells and suctions
Filter Plant
Pumping Stations
Distribution System
Tools and equipment
Furniture and Fixtures
Miscellaneous
Intangible $150,000.
Floating Assets $140,000.
Outside Investments $900
Deferred Charges $1000
LIABILITIES
Funded Debt $1,000,000.
Deposits
Meters $50,000
Extensions $25,000.
Prepayments $30,000.
Floating Liabilities $120,000.
PROPRIETORSHIP
Capital Stock $1,250,000.
Surplus $10,000.
Reserves $15,000.
DIAGRAM No III

public utility commissions and largely on the author's personal experience in public and private water works.

The diagram is arranged in two parts, upper and lower. The upper portion is the same as diagram III on which the scale runs horizontally. The lower portion of the chart is a box divided in half by a double vertical line running down the center. It contains data supporting the upper chart. To the left are shown assets, corresponding to the top part of the upper chart, and, to the right, liabilities and proprietorship, corresponding to the bottom part of the upper diagram. In the lower diagram each division contains the same general accounts as are shown on the part of the upper chart which it represents, but in addition it also shows detailed accounts, together with amounts; for example, above is shown, under "Non Landed Intangible Capital" the item of "Pumping Stations" below this same account is shown, but divided into four parts, buildings and chimneys, boiler plant, pumping machinery and miscellaneous station equipment: among the liabilities the upper diagram shows floating liabilities, but in the lower portion this is divided into notes payable, accounts payable, interest, etc.

BALANCE SHEET OF X. Y. Z. WATER COMPANY

As at April 30, 1916

Assets

FIXED CAPITAL			
Landed			
Water supply sources and works		$62,500	
Embankments, ditches, roads, etc		10,000	
Other lands		2,500	
Total			$75,000
Non Landed			
Tangible			
Wells and suction		$100,000	
Filter plant		50,000	
Pumping stations			
Buildings and chimneys	$75,000		
Boiler plant	50,000		
Pumping machinery	200,000		
General station equipment	25,000	350,000	
Distribution system			
Mains and appurtenances	$1,500,000		
Hydrants and connections	150,000		
Meters and fittings	75,000		
Standpipe	20,000		
Fountains, troughs, etc	5,000	1,750,000	

Tools and implements		$50,000	
Furniture and fixtures		15,000	
Miscellaneous tangible capital (Maps, plan books, etc.)		10,000	
		$2,325,000	
Less depreciation to date		200,000	$2,125,000
Intangible			
Cost of franchise rights		$75,000	
Promotion and organization		50,000	
Unamortized debt discount and expense		75,000	
		$200,000	
Less amortization to date		50,000	150,000
TOTAL FIXED CAPITAL			$2,350,000
FLOATING CAPITAL			
Cash		$40,000	
Notes receivable		15,000	
Accounts receivable			
Current year	$50,000		
Prior years	15,000		
	$65,000		
Less reserve for doubtful accounts	5,000	60,000	
Inventories			
Coal	10,000		
Material and supplies	5,000	15,000	
Other floating capital		10,000	
TOTAL FLOATING CAPITAL			140,000
Investments in outside enterprises			9,000
Deferred charges			1,000
			$2,500,000

Liabilities

FUNDED DEBT			
Mortgage Bonds			$1,000,000
Consumers' Deposits			
Meter deposits		$50,000	
Extension guarantees		25,000	75,000
Prepayments			
Water rates paid in advance			30,000
FLOATING LIABILITIES			
Notes payable		$12,500	
Accounts payable		30,000	
Interest accruals			
on bonds	$12,500		
on notes	500		
on taxes	1,000	14,000	
Accrued taxes		25,000	
Accrued income tax on bond coupons		1,000	
Dividend declared (semi-annual)		37,500	
TOTAL FLOATING LIABILITIES			120,000

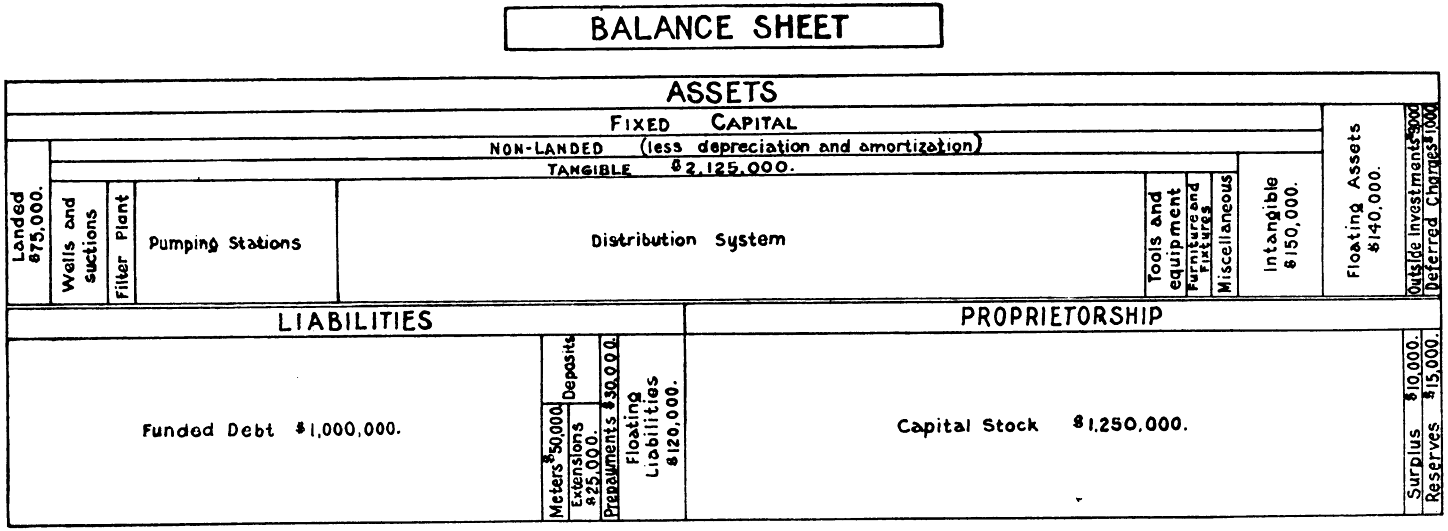


DIAGRAM No III

LANDED	Water Supply, sources and works	$ 62500		Funded Debt (Mortgage Bonds)	$ 1000000
	Embankments, ditches, roads, etc.	10000			
	Other lands	2500	75000		
	Wells and Suctions		100000		
	Filter Plant		50000		
Stations	Buildings and Chimneys	75000			
	Boiler Plant	50000			
	Pumping Machinery	200000			

ASSETS

FIXED CAPITAL

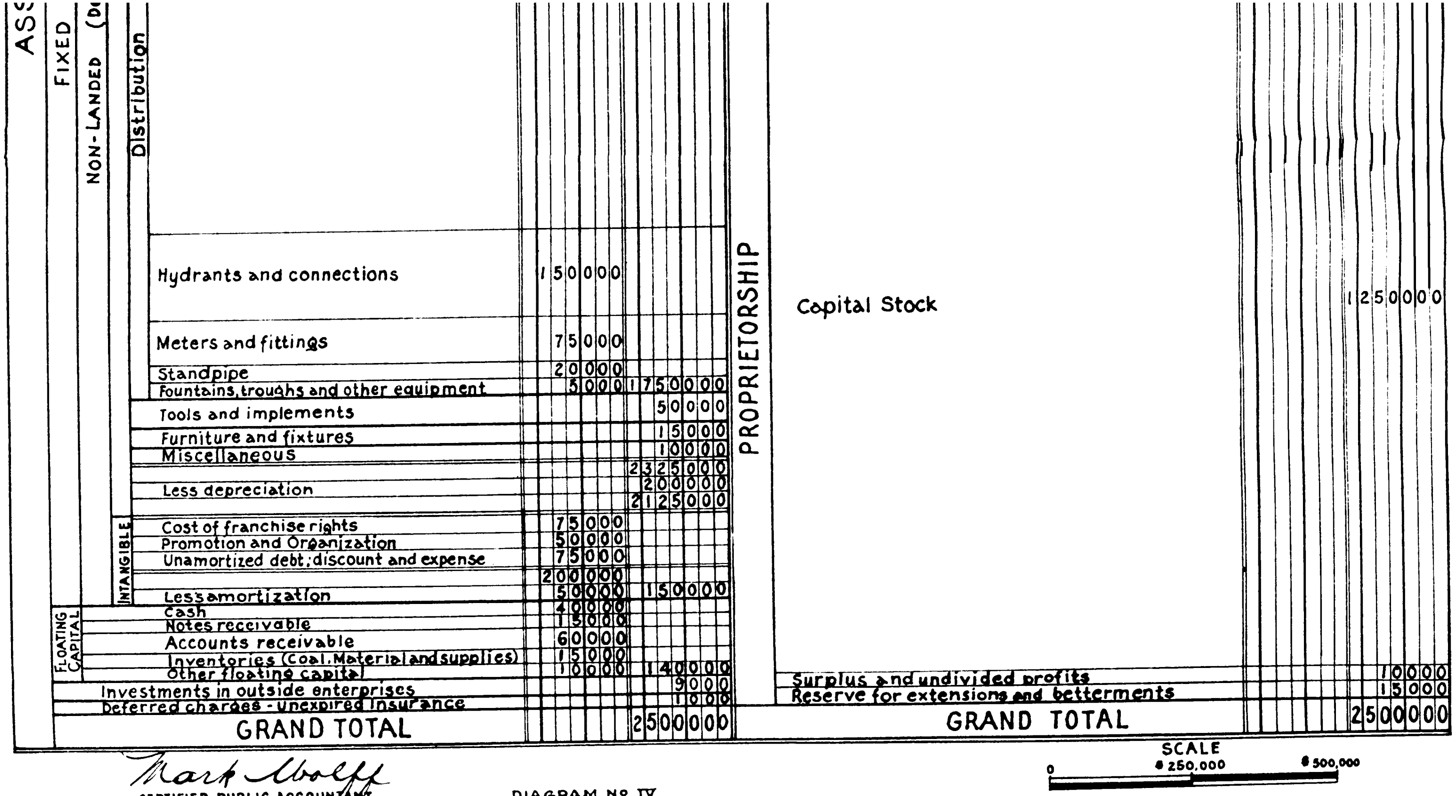
NON-LANDED (Deduct depreciation and amortization)

TANGIBLE

	Wells and Suctions		
	Filter Plant		50000
Pumping Stations	Buildings and Chimneys	75000	
	Boiler Plant	50000	
	Pumping Machinery	200000	
	Miscellaneous station equipment	25000	350000
Distribution System	Mains and appurtenances	1500000	

LIABILITIES

	Funded Debt (Mortgage Bonds)			1000000
Consumers' Deposits	Meter deposits		50000	
	Extension guaranties		25000	75000
	Prepayments - water rates paid in advance			30000
Floating Liabilities	Notes payable		12500	
	Accounts payable		30000	
	Interest Accruals	On Bonds	12500	
		On Notes	500	
		On Taxes	1000	
	Accrued Taxes		25000	
	Accrued Income tax on bond coupons		1000	
	Dividend declared (Semi-annual)		37500	120000



Mark Wolff
CERTIFIED PUBLIC ACCOUNTANT
1328 BROADWAY
NEW YORK CITY

DIAGRAM No IV

Proprietorship

Capital Stock	$1,250,000
Surplus and undivided profits	10,000
Reserve for extension and betterments	15,000
	$2,500,000

The following is a summarized Income Account of the theoretical water works whose Balance sheet is shown immediately preceding.

INCOME ACCOUNT

			AMOUNT	PER CENT	
OPERATION					
Operating Revenues					
Sale of water		$325,000		81.25	
Other operating revenues		75,000		18.75	
Total Operating Revenues			$400,000		100.00
Operating Expenses					
Operation		$78,000		19.50	
Maintenance					
Repairs and replacements	$20,000				
Depreciation	40,000	60,000		15.00	
General and administrative		50,000		12.50	
Total Operating Expenses			188,000		47.00
			$212,000		53.00
Bad Debts		$2,000		0.50	
Taxes		35,000	37,000	8.75	9.25
INCOME FROM OPERATION			$175,000		43.75
NON OPERATION					
Non operating revenues		$6,000			
Non operating revenue deductions		1,000	5,000		1.25
GROSS INCOME			$180,000		45.00
CORPORATE INCOME					
Income Deductions			5,000		1.25
			$175,000		43.75
Return on investment		$125,000		31.25	
Appropriation of income		40,000	165,000	10.00	41.25
BALANCE TO SURPLUS			$10,000		2.50

The summary Income Account is here shown in diagram form arranged in three parts, entitled "Operating," Non Operating" and "Corporate" Income respectively.

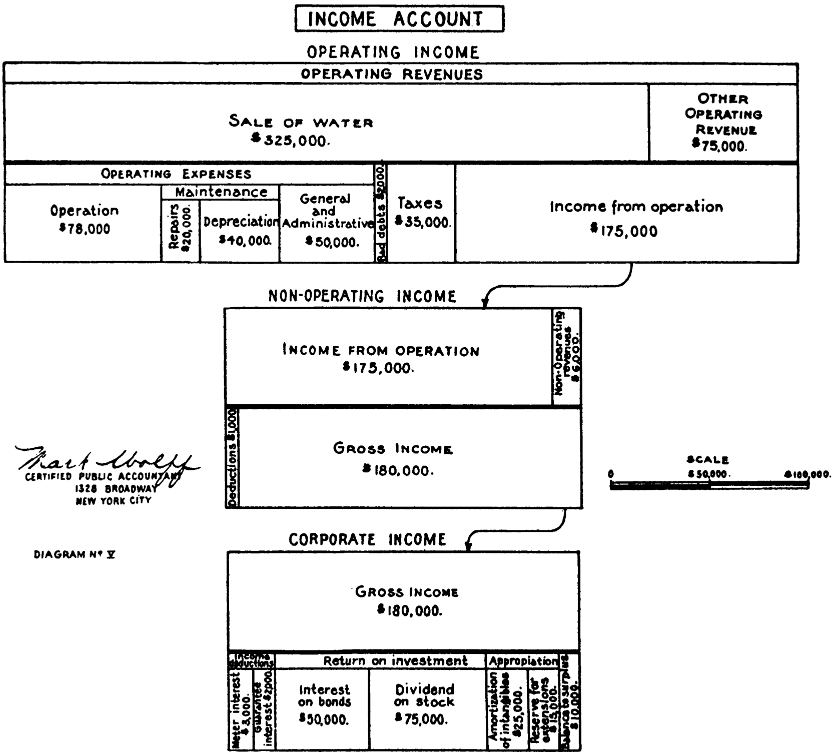


DIAGRAM Nº V

The first section will be found most interesting to the operating engineer, the second relates mainly to financing and the third will be the first place to strike the eye of the investor. Each of these three sections is shown individually in the requisite detail with the usual supporting accounts on three separate charts; opposite which will be found, in ordinary accounting form, that portion of the Income Account which relates thereto. The three detailed diagrams will be found on pages 545, 549 and 550.

The first section, Operating Income Account, which is of greatest interest to the superintendent, will be found to contain the sources of operating income and objects of operating expenditure. As in the Balance Sheet, the amounts represented are estimated and are not based on the operations of any particular water works. Although these figures are assumed, they will nevertheless be found interesting.

Take, for example, the relationship between revenues from metered and unmetered service. In this case, they are both of equal amount, which, of course, does not necessarily mean that each represents the same amount of consumption. This is said having in mind particularly the experience of the City of New York, whose revenues from both kinds of services are about equal, but whose consumption through meters is only 27 per cent of the total amount of water consumed, lost and wasted. The question of the relatively small amount of water waste under the meter system as compared with the wastage on a flat rate basis is here automatically suggested. In this connection, the City of New York has just had a bill introduced in the legislature the passing of which will mean that eventually the entire city will be metered. Then, getting back to the Income Account, note the amount of revenues derived from fire protection, erroneously called hydrant rentals by some, and compare with total revenues. This percentage, 18, will, of course, vary in different water works, according to peculiar local conditions. A case in point is that of the Queens County Water Company, on which the author assisted Deputy Commissioner Delos F. Wilcox in his valuation and rate investigation. Fire protection will again be referred to, treating it as a separate topic on account of its importance.

Under operating expenses, no doubt some of you will find something to say regarding the ratio between the expenditures for operation and maintenance of the various parts of the plant compared with the assets shown by the Balance Sheet, as well as the ratio between one kind of expense and another. The item of "depreciation" on various parts of the plant as shown in the Income Account ought to stimulate discussion.

Following is the estimated life of the various assets used in arriving at the annual depreciation shown in the Income Account: horses, carriages and motors, 10 years; office furniture and general equipment, 15 years; boilers, steam pipes, filters, 20 years; pumping machinery and engines, 25 years; mains, fire hydrants, standpipes, buildings, masonry, 50 years; reservoirs, aqueducts, 100 years.

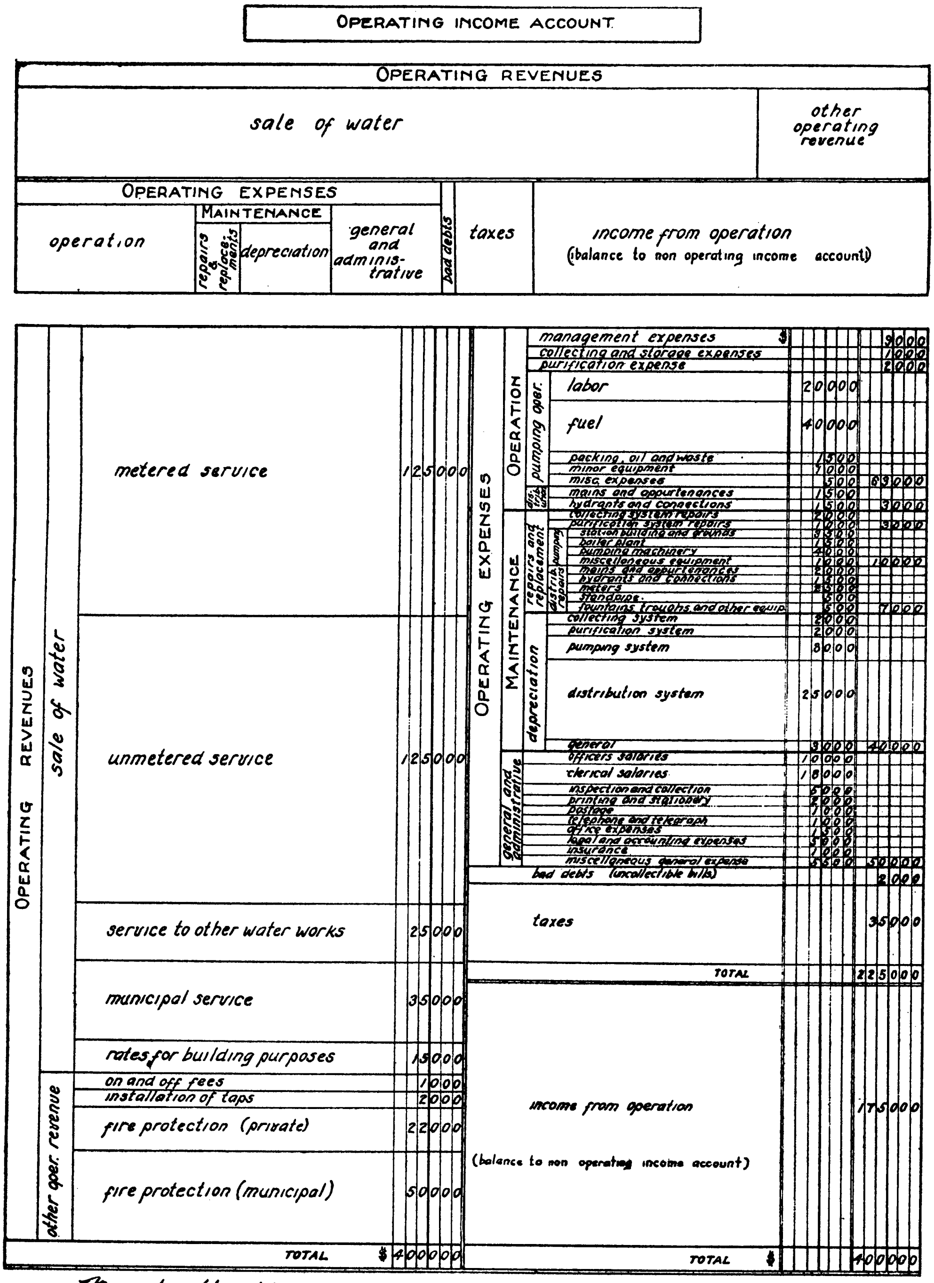
The following three pages contain, in both ordinary and diagram form, the Operating section of Income Account referred to above.

Income Statement of the X. Y. Z. Water Company

Period, May 1, 1915, to April 30, 1916

Operating Income Account

						PER CENT OF TOTAL OPERATING REVENUES $400,000.00
Operating Revenues						
Revenues from water service						
Metered service			$125,000			31.25
Unmetered service			125,000			31.25
Service to other water works			25,000			6.25
Municipal service			35,000			8.75
Rates for building purposes			15,000	$325,000		3.75
Other operating revenues						
On and off fees			$1,000			0.25
Installation of taps			2,000			0.50
Fire protection—private			22,000			5.50
Fire protection—municipal			50,000	75,000		12.50
Total Operating Revenues					$400,000	100.00
Operating Expenses						
Operation						
Management expenses		$9,000				2.25
Collecting and storage expenses		1,000				0.25
Purification expenses		2,000				0.50
Pumping expenses						
Labor	$20,000					5.00
Fuel	40,000					10.00
Packing, oil and waste	1,500					0.37
Minor equipment	1,000					0.25
Miscellaneous	500	63,000				0.13
Distribution expenses						
Mains and appurtenances	$1,500					0.37
Hydrants and connections	1,500	3,000				0.38
Total operation				$78,000		19.50
Maintenance						
Repairs and Replacements						
Collecting and storage		$2,000				0.50
Purification		1,000				0.25



OPERATING INCOME ACCOUNT

OPERATING REVENUES	
sale of water	other operating revenue

OPERATING EXPENSES						
	MAINTENANCE					
operation	repairs & replacements	depreciation	general and administrative	bad debts	taxes	income from operation (balance to non operating income account)

OPERATING REVENUES			
sale of water	metered service	125000	
	unmetered service	125000	
	service to other water works	25000	
	municipal service	35000	
	rates for building purposes	15000	
other oper. revenue	on and off fees	1000	
	installation of taps	2000	
	fire protection (private)	22000	
	fire protection (municipal)	50000	
	TOTAL	$400000	

OPERATING EXPENSES					
OPERATION		management expenses	$		9000
		collecting and storage expenses			1000
		purification expense			2000
	pumping oper.	labor		20000	
		fuel		40000	
		packing, oil and waste		1500	
		minor equipment		1000	
		misc. expenses		500	63000
	distribution	mains and appurtenances		1500	
		hydrants and connections		1500	3000
MAINTENANCE	repairs and replacement	collecting system repairs		2000	
		purification system repairs		1000	3000
	pumping	station building and grounds		3500	
		boiler plant		1500	
		pumping machinery		4000	
		miscellaneous equipment		1000	10000
	distrib. repairs	mains and appurtenances		2000	
		hydrants and connections		1500	
		meters		2500	
		standpipe		500	
		fountains, troughs and other equip.		500	7000
	depreciation	collecting system		2000	
		purification system		2000	
		pumping system		8000	
		distribution system		25000	
		general		3000	40000
general and administrative		officers salaries		10000	
		clerical salaries		18000	
		inspection and collection		5000	
		printing and stationery		2000	
		postage		1000	
		telephone and telegraph		1000	
		office expenses		1500	
		legal and accounting expenses		5000	
		insurance		1000	
		miscellaneous general expense		5500	50000
bad debts (uncollectible bills)					2000
taxes					35000
TOTAL					225000
income from operation (balance to non operating income account)					175000
TOTAL			$		400000

Mark Wolff
CERTIFIED PUBLIC ACCOUNTANT
1328 BROADWAY
NEW YORK CITY

DIAGRAM Nº VI

SCALE
0 $50,000. $100,000.

Pumping Stations						
Buildings and grounds....	$3,500					0.87
Boiler plant..	1,500					0.38
Pumping machinery	4,000					1.00
Miscellaneous equipment.	1,000	$10,000				0.25
Distribution						
Mains and appurtenances	$2,000					0.50
Hydrants and connections.......	1,500					0.37
Meters.......	2,500					0.63
Standpipes...	500					0.13
Fountains, troughs, etc.	500	7,000				0.12
Total Repairs and Replacements.			$20,000			5.00
Depreciation						
Collecting and storage system..............		$2,000				0.50
Purification system....		2,000				0.50
Pumping system......		8,000				2.00
Distribution system...		25,000				6.25
General..............		3,000				0.75
Total Depreciation...............			40,000			10.00
Total maintenance..........................				$60,000		15.00
General and administrative						
Officers' salaries................			$10,000			2.50
Clerical salaries..................			18,000			4.50
Inspection and collection.........			5,000			1.25
Printing and stationery...........			2,000			0.50
Postage..........................			1,000			0.25
Telephone and telegraph.........			1,000			0.25
Office expenses..................			1,500			0.37
Legal and accounting expenses...			5,000			1.25
Insurance.......................			1,000			0.25
Miscellaneous...................			5,500			1.38
Total general and administrative.............				50,000		12.50
TOTAL OPERATING EXPENSES..........................					$188,000	47.00
					$212,000	53.00
Uncollectible bills............................				$2,000		
Taxes....................................				35,000	37,000	9.25
INCOME FROM OPERATION.............................					$175,000	43.75

As stated hereinbefore, the second section of the Income Account relates mainly to finances. One item therein, penalties on accounts receivable, $2000, is suggestive. It is the opinion of the author that all private water companies, particularly those controlled by a Public Service Commission or other regulatory body, should have the right to charge penalties on accounts receivable, especially since, unlike the municipal plant, they do not as a rule have a lien against the property as insurance against loss through non payment. In the matter of liens, one of the companies in New York City has adopted, with considerable success, a rather clever, if not original, device for obtaining a lien against property. This is accomplished by adding to the regular form of application for service a clause whereby the owner agrees to the lien. The filing of a duplicate of the application in the County Clerk's office makes the application in effect a lien on the property. The absence of the security afforded by a lien is particularly embarrassing in some cases for the water company; a case in point, in the experience of another company. A certain real estate company owned the fee in a private street which had not been dedicated to the city. The realty company failed, the mortgagees foreclosed and, by virtue of their prior lien against the property, obtained possession of the street. The water company had an easement through this street, but the mortgagees had priority and the foreclosure of the mortgage wiped out this easement, at least so the mortgagees claim. This point is disputed by the water company and it is more than likely that the latter will win, but only after considerable annoyance and expense through litigation. If the mortgagees should win, the title to all the pipe in the street, laid at the water company's expense, would vest in the mortgagee. In this case, if the water company possessed a lien against this property, it not only would have collected the water bill against the realty company, but a dispute such as this would have been impossible. If public policy is against the granting of a lien to a public utility conducted for profit, then the company should at least be allowed to impose penalties for delinquent payment on account. The imposition of penalties would greatly reduce the losses through bad debts. The second, Non Operating, section of Income Account above referred to is shown on pages 548 and 549.

While the third section, "Corporate Income," has general interest, it relates more particularly to the returns on investments of bondholders and stockholders. It shows, besides the profitableness or unprofitableness of the enterprise, the financial policy of the com-

Income Statement—(*continued*)

Non Operating

Income from Operation			$175,000
Non Operating Revenues			
Penalties on Accounts Receivable	$2,000		
Interest on Notes Receivable	1,000		
Interest on Bank Balances	1,000		
Interest and Dividends on investments	1,000		
Miscellaneous	1,000	$6,000	
Non Operating Revenue Reductions			
Interest on Accounts Payable	$500		
Interest on Notes Payable	500	1,000	5,000
Gross Income			$180,000

pany. By this the policy of amortizing the intangibles is referred to. In this connection, none of the books of the water companies examined by the author sets aside reserves for extensions and betterments or amortizes intangibles. In this section it is also shown that this theoretical company allows interest on meter deposits, something which is done by only two of the companies whose books have been examined. The extension guaranties, on which interest is also allowed, represent deposits of new consumers, by means of which they induce the water company to extend its mains to new and undeveloped territory. These deposits are returned in instalments as the consumers' water bills grow large enough to justify the company assuming the cost of the extensions. (See page 550 for diagram VIII illustrating the following statement, referred to above.)

Income Statement—(*concluded*)

Corporate Income

Gross Income		$180,000
Income Deductions		
Interest on meter deposits	$3,000	
Interest on extension guaranties	2,000	5,000
Net Corporate Income		$175,000
Return on Investment		
Interest on bonds	$50,000	
Dividends on stock	75,000	125,000
		$50,000
Appropriation of Income		
Amortization of intangibles	$25,000	
Reserve for extensions and betterments	15,000	40,000
Balance to Surplus and Undivided Profits		$10,000

NON-OPERATING INCOME ACCOUNT

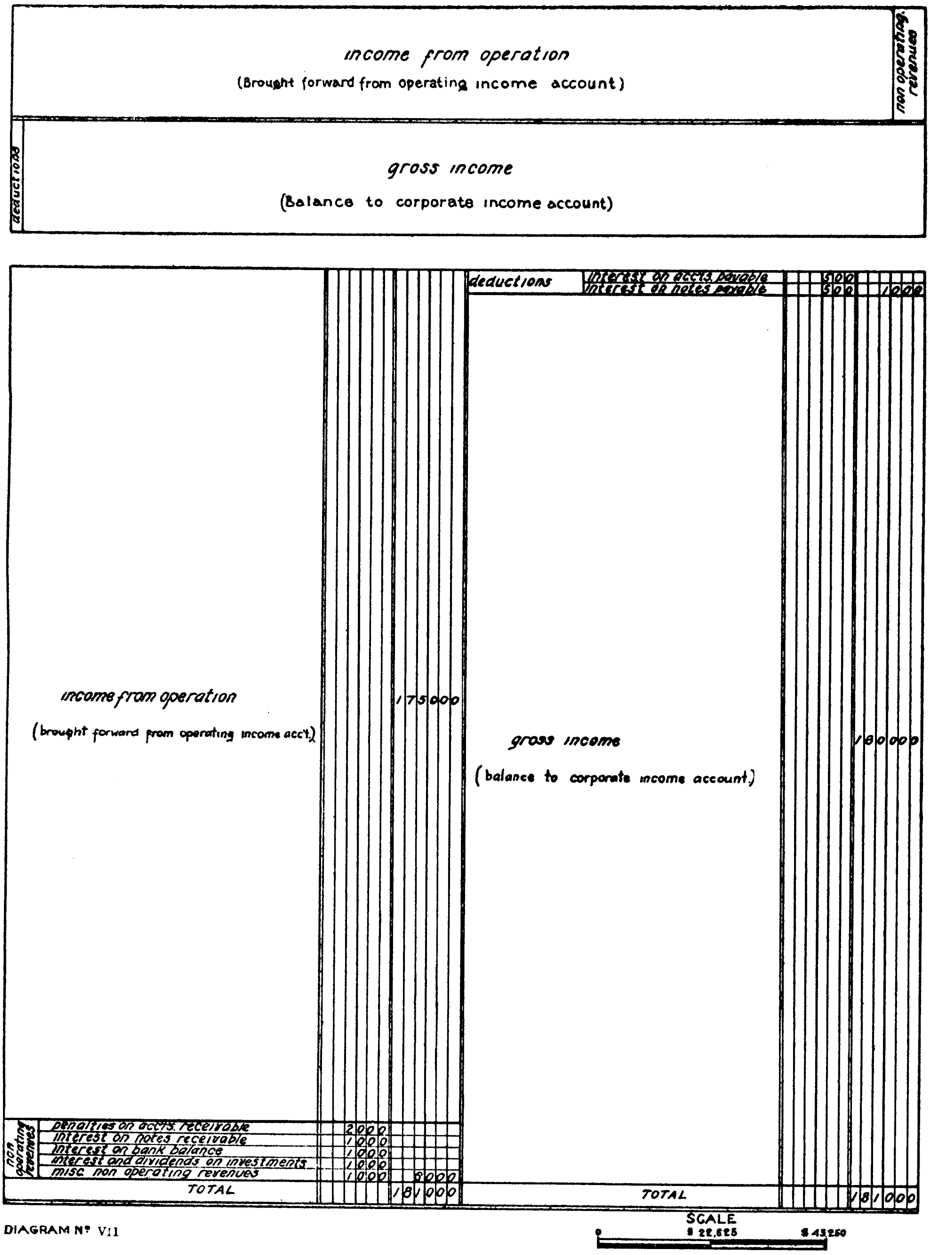

income from operation
(Brought forward from operating income account)
non operating revenues
deductions
gross income
(Balance to corporate income account)
income from operation
(brought forward from operating income acct.)
175000
non operating revenues
penalties on accts. receivable 2000
interest on notes receivable 1000
interest on bank balance 1000
interest and dividends on investments 1000
misc non operating revenues 1000
6000
TOTAL 181000
deductions
interest on accts. payable 500
interest on notes payable 500
1000
gross income
(balance to corporate income account)
180000
TOTAL 181000
SCALE
0
$ 22,625
$ 43,250

DIAGRAM N° VII

CORPORATE INCOME

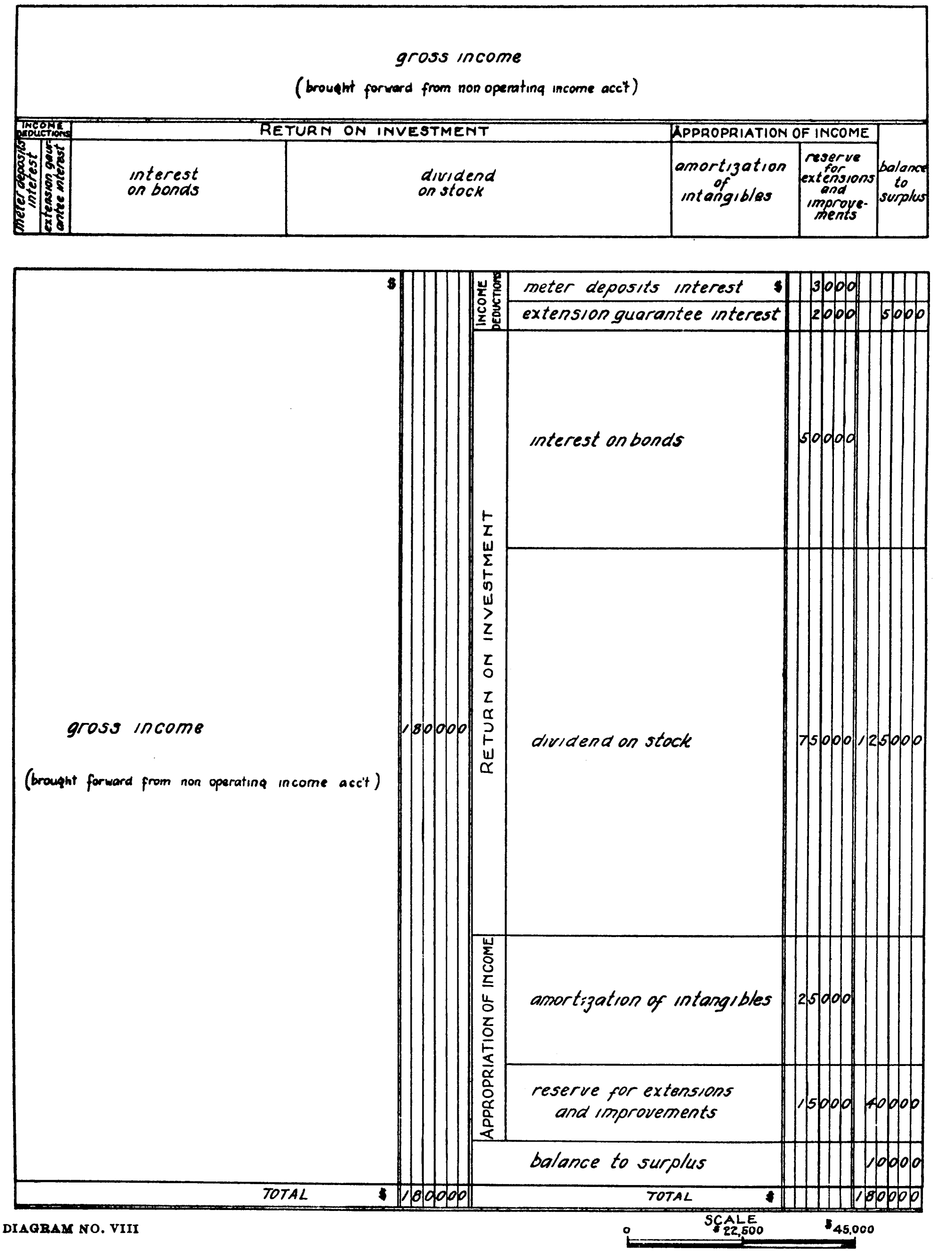

gross income
(brought forward from non operating income acc't)
INCOME DEDUCTIONS
meter deposits interest
extension guarantee interest
RETURN ON INVESTMENT
interest on bonds
dividend on stock
APPROPRIATION OF INCOME
amortization of intangibles
reserve for extensions and improvements
balance to surplus
gross income
(brought forward from non operating income acc't)
$ 180000
meter deposits interest $ 3000
extension guarantee interest 2000 5000
interest on bonds 50000
dividend on stock 75000 125000
amortization of intangibles 25000
reserve for extensions and improvements 15000 40000
balance to surplus 10000
TOTAL $ 180000
TOTAL $ 180000
SCALE
0
$22,500
$45,000

DIAGRAM NO. VIII

FIRE PROTECTION

The problem of estimating cost of fire protection is considered such an important one that special reference is made to it. Mr. Delos F. Wilcox, Deputy Commissioner, in making up the various tables shown in his report on the Queens County Water Company rate case, included those concerning fire protection. No doubt many of you have already read that report and are therefore more or less familiar with the following extracts from one of Mr. Wilcox's articles. Speaking of the Queens County case, he says:

> In distributing the cost between domestic service and fire protection, the following method was pursued and the following results obtained:
>
> We began by rejecting the obvious fallacy that the amount of water actually used for the putting out of fires in the course of a year is important. We regarded it as so unimportant that we made no allowance whatsoever for it in the final figures of cost.
>
> We also rejected the fallacy, which seems sufficiently obvious after a little reflection, that the cost of fire protection can be measured by an annual hydrant rental at a fixed rate per hydrant. The hydrant is only the spigot out of which the fire-destroying fluid flows. The conduits that convey the water, the pumps that drive it, the wells that furnish it, are substantially the same whether there are 500 hydrants or 1000. Clearly, if the cost of fire protection is apportioned to 500 hydrants on the basis of an annual rental per hydrant, when the number of hydrants is doubled the payment for fire protection will be greatly in excess of cost. The reverse would be true if the number of hydrants were reduced.
>
> We also rejected the fallacy that the cost of fire protection can be fixed as a lump sum payable annually without change over a number of years; for if the number of hydrants is increased the company will get nothing for the additional investment and will rightly feel that every new hydrant ordered represents a dead loss to it, a sheer contribution to the expenses of government, a forced levy, so to speak.
>
> We also rejected the contention, which in the absence of franchise or statutory provisions supporting it can hardly be dignified with the name theory, that a private water company is under obligation to serve the public organized as a city for nothing or for less than cost.
>
> * * * * * * * *
>
> We assumed that the company was organized primarily for the sale of water to private consumers for profits, and the city was entitled to get fire protection at its actual cost as an incidental or surplus service.
>
> After putting a valuation upon the property used and useful in the water business, we were compelled to distribute it between domestic service and fire protection according to the theory adopted. Accordingly, we estimated the cost of a substitute plant fully adequate for domestic service, but without the reserve necessary to meet the fire hazard and without any of the equip-

ment designed exclusively for fire protection. The estimated cost we set up as the investment on the basis of reproduction cost new properly chargeable to domestic service. The difference between this investment and the cost of the company's plant as actually constructed and in use was treated as the surplus investment properly chargeable to fire protection. Of course, in arriving at the actual amount of the present investment, accrued depreciation was deducted.

On this basis we found that 23.2 per cent of the entire investment was attributable to fire protection. This percentage varied with the different classes of property. Of the value of the mains it was about 22 per cent; of pumping station buildings, 25.7 per cent; of water lands, wells and suction lines, 33 per cent; of pumping machinery and standpipes, 50 per cent; of hydrants, 100 per cent; of filters, meters, tools, office buildings and land, miscellaneous equipment and going value, no per cent.

* * * * * * * *

As the first element in the cost of fire protection, we charged up the fair return, 7 per cent on the 23.2 per cent of the investment regarded as surplus over what would have been necessary for domestic service. We also charged depreciation against this portion of the investment, the rate of depreciation having been figured out separately for each class of property. We then undertook to assign a proper portion of operating expenses and taxes to fire protection, and after a detailed analysis of the various classes of expenses we arrived at the conclusion that 15 per cent should be charged to fire protection. Putting the figures all together, we found that the company should receive from the city for fire protection and other hydrant uses about 21 per cent of its gross revenues. This was a little more than three times the percentage it had been receiving.

From the above it will seen that the annual cost of fire service is made up of three elements.

1. Return upon that portion of the investment necessary to provide fire protection.
2. Depreciation of property representing such investment.
3. Portion of operating expenses incidental to the rendering of fire service.

In order to determine the last element, it is essential that the accounts of the company furnish adequate classification of operating expenses, as is shown by the preceding Income Account. It is, however, not sufficient that the accounts be properly classified; it is at least equally important that they be assembled into an estimate such as hereinabove described. This is so apparent from the following diagram (No. IX) of Fire Protection Income Account, that further comment is unnecessary.

QUEENS COUNTY WATER COMPANY
INCOME ACCOUNT
FIRE PROTECTION ATTRIBUTABLE TO QUEENS SERVICE

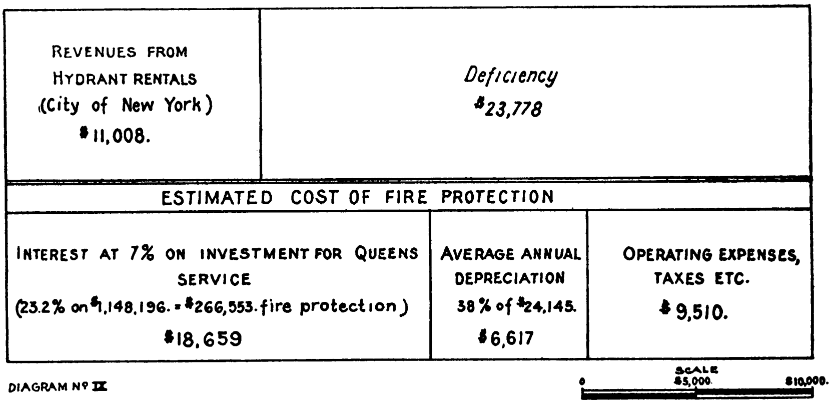


DIAGRAM Nº IX

The percentage of the various operating expenses attributable to fire protection is shown in the table below, the average being 15 per cent.

Class of Expenses	*Percentage Attributable to Fire Protection*
Salaries	6
Stationery and Office Supplies	0
Office Expenses (including telephone)	40
Operation of Pumping Station:	
Wages	10
Coal	0
Oil, Packing, Waste, Light	0
Minor Equipment	0
Rockaway Park Station	50
Reading Meters	0
Bottling	0
Stable and Garage Expense	20
Operation of Filters	0
Brooks and Streams	0
Maintenance of Mains	10
Maintenance of Boilers	25
Maintenance of Machinery (including pumps)	25
Maintenance of Buildings	25
Maintenance of Meters	0
Maintenance of Standpipes	50
Maintenance of Wells	33
Maintenance of Hydrants	100
Maintenance of Tools	0

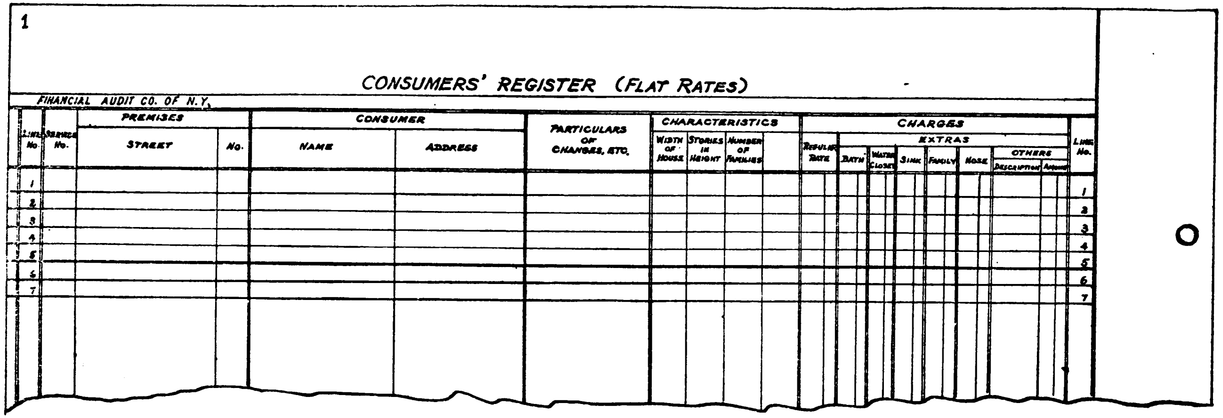
Class of Expenses	*Percentage Attributable to Fire Protection*
Cleaning Pipes	26
Permits and Tapping	0
Inspection and Collection	0
Fire Insurance	38
Life Insurance	0
Miscellaneous Expenses	0
Legal Expenses	20
Taxes	26
Total . . . Average	15

ACCOUNTING SYSTEMS

The wide scope of the subject which the author attempted to cover was not realized until the writing of this article was well under way. Originally, it was planned to introduce the accounts by classes and diagrams, and in addition thereto illustrate or describe a set of office and field records, including pumping station efficiency data, which would provide for the proper keeping of the accounts in conformity with the classifications. But the latter part of the plan had to be abandoned to avoid making the article too long, even though the discussion of some of the important items making up the Balance Sheet and Income Account have been slighted. In closing, however, the author will mention the fact that it has come to his attention that there are still a number of water works which do not accrue their income on a revenue and expenditure basis, but which take account of cash receipts and disbursements only. This, it is almost needless to remark, is a very dangerous practice, when it is considered that an ascertainment of the revenues and expenses applicable to a particular period, whether paid or not, is vital to the question of determination of proper rates.

As regards revenues, the chief difficulty seems to lie in the lack of proper charging records. To this end, the author would suggest the use of the following or similar form by companies billing once a year and rendering service on a flat rate basis. This record, Consumers' Register, can be modified according to the frequency of billing and the method of determining rates, whether based on frontage, fixtures, number of rooms or assessed valuation.

The two sheets shown fit in a loose leaf binder. The upper sheet is virtually a record of inspection and shows also the details of charges. It is more or less a permanent record, while the other sheet, being shorter, is an insert, which can be replaced or added



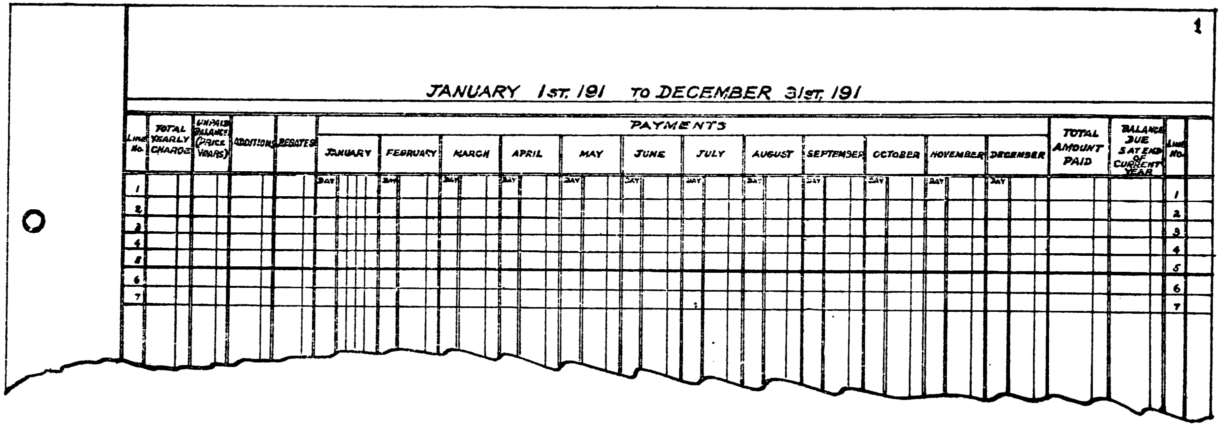
1

CONSUMERS' REGISTER (FLAT RATES)

FINANCIAL AUDIT CO. OF N.Y.

LINE NO.	SERVICE NO.	PREMISES		CONSUMER		PARTICULARS OF CHANGES, ETC.	CHARACTERISTICS				CHARGES								LINE NO.
		STREET	NO.	NAME	ADDRESS		WIDTH OF HOUSE	STORIES IN HEIGHT	NUMBER OF FAMILIES		REGULAR RATE	EXTRAS							
												BATH	WATER CLOSET	SINK	FAMILY	HOSE	OTHERS		
																	DESCRIPTION	AMOUNT	
1																			1
2																			2
3																			3
4																			4
5																			5
6																			6
7																			7

ACTUAL SIZE OF SHEET 21"x 17."



1

JANUARY 1ST. 191 TO DECEMBER 31ST. 191

LINE NO.	TOTAL YEARLY CHARGE	UNPAID BALANCE (PRICE YEARS)	ADDITIONS	REBATES	PAYMENTS												TOTAL AMOUNT PAID	BALANCE DUE $ AT END OF CURRENT YEAR	LINE NO.
					JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER			
					DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY			
1																			1
2																			2
3																			3
4																			4
5																			5
6																			6
7																			7

ACTUAL SIZE OF SHEET 18¾" x 17"

to with the lapse of time. The latter shows record of payments, etc., arranged according to month. One side of this sheet will show payments for a year and another year's record will be shown on the back, after the leaf is turned to the left, to match the location shown on the left hand sheet.

A summation of the left hand sheet will give the total of the various classes of charges for a particular period. The right hand sheet will show the total amount of payments received within each month, total additions during year, total allowances, and total amount outstanding at the end of the year. The amount of consumers accounts receivable outstanding at the end of any particular month can also be readily ascertained therefrom.

As to the expenses, these can easily be ascertained by the installation of the unit system of vouchering, by means of which the charges against a particular account at the end of each month are ascertained by summing up vouchers contained in the file supporting the account. This does away with the voucher register and its accompanying multiplicity of columns. It also simplifies the cash book.

As regards capital expenditures, it is hardly necessary to add that the subject of proper accounting is most important, particularly in a public utility. In rate cases, the courts are looking with more and more favor upon the original cost method of valuation as against the cost of reproduction. The extensive use of the latter method in the past has not necessarily been due to a preference for that method on the part of the courts. In many cases its use can be attributed solely to the lack of proper original cost records, in the absence of which the courts have been obliged to accept the alternative. But so much attention has been directed to the need of proper original cost data that it would be unreasonable to expect the courts to continue indefinitely to accept the excuses advanced by corporations for not having the necessary information.

The author trusts that his efforts are substantially in compliance with the wishes of your association. He agrees with your genial secretary that it would take a fairly good size book to handle the subject adequately and that, if the whole subject is confined to a paper of limited space, it can only be covered in a general way. If this article is responsible for the discussion of some of the points involved, the object of the author will have been attained.